In the Specification:

Please **delete** the heading at **page 1, lines 1 to 2.**

Please **add** a new heading at **page 1, above line 3**, as follows:

TITLE OF THE INVENTION

Please **replace** the Title at **page 1, lines 3 and 4** with a replacement Title amended as follows:

~~Flow-Mechanically~~ Fluid Dynamically Effective Surface for Minimizing Induced Resistance

Please **add** a new heading at **page 1, above line 5**, as follows:

FIELD OF THE INVENTION

Please **replace** the paragraph at **page 1, lines 5 to 10,** with a replacement paragraph amended as follows:

The invention relates to a ~~flow-mechanically~~ fluid dynamically effective surface of a device moving in a fluid, especially a flying machine, especially a supporting or lifting surface of a flying machine, whereby the surface comprises an elastic axis extending in the span direction of the surface and an adjustable control ~~surface, as prescribed in the preamble of the claim 1.~~ surface.

Please **add** a new heading at **page 1, above line 11**, as follows:

BACKGROUND INFORMATION

Please **replace** the paragraph at **page 1, lines 11 to 25,** with a replacement paragraph amended as follows:

In connection with a device moving in a fluid, there arises during the movement through the fluid, thus perhaps in connection with a flying machine during flight, a deformation of the ~~flow-mechanically~~ fluid dynamically effective surface, thus of the lifting surface of the flying machine. This deformation is variable or changeable and depends on the effective aerodynamic forces and the inertial and/or mass forces. These are dependent on the flight condition (speed, altitude), as well as on the loading condition (useful payload, fuel quantity, position of center of gravity). Without special measures, a wing can only be designed so that it comprises the deformation that is most advantageous for the aerodynamic resistance or drag only for a single condition and time point of a flight. A different deformation, which is not ~~resistance-minimal,~~ drag-minimal, arises for every other condition and for every other time point.

Please **replace** the paragraph at **page 2, lines 1 to 9,** with a replacement paragraph amended as follows:

In the state of the art, no systems have previously become known, with which the structural deformation of wings can be adapted or matched to a form or shape that is optimal for the aerodynamic resistance or drag. The influence of the structural deformation was either neglected or

disregarded, simply put up with, or in the best case taken into consideration such that the deformation that is most advantageous for the aerodynamic ~~resistance~~ drag arises for an "average" flight condition (average loading, half flight time).

Please **replace** the paragraph at **page 2, lines 10 to 24,** with a replacement paragraph amended as follows:

While, of course, control surfaces that are per se adjustable are known on such ~~flow-mechanically~~ fluid dynamically effective surfaces such as the lifting surface of a flying machine, these, however, serve for the control of the flight attitude or the trimming of the aircraft, but not, however, a change or variation of the deformation of the wing in the sense of an adaptation or matching to the form that is most advantageous for the aerodynamic ~~resistance~~ drag dependent on the flight and loading condition. It is also known, to use conventional control surfaces on the wing trailing edge (aileron) for influencing the aerodynamic pressure distribution for a smaller structural loading (load reduction), a similar control surface concept has also become known for improving the roll control for an experimental version of a combat aircraft, similarly also for the same purpose the additional use of flaps along the wing leading edge.

Please **replace** the paragraph at **page 2, line 25 to page 3 line 17,** with a replacement paragraph amended as follows:

The aerodynamic pressure distribution and the structural loading change or vary due to differing flight conditions (altitude, speed) and loading conditions (useful payload, fuel, position of center of gravity), whereby different elastic deformations arise. This deformation condition influences the aerodynamic (lift induced) resistance. For a given span, and without consideration of the structural loading, the minimal resistance arises for an elliptical aerodynamic pressure distribution over the span. This can be achieved through an elliptical wing plan form or through a corresponding torsion or twisting of the wing profile chord in the span direction relative to the direction of incident flow or relative wind. A wing torsion deformation in the span direction (twisting) as well as a bending deformation on the swept-back wing influence this distribution. Therefore, the ~~resistance-minimal~~ <u>drag-minimizing</u> deformation condition can only prevail for a short time during the total duration of a flight, in which the fuel quantity changes and the flying proceeds with different speeds at different altitudes. Moreover, the magnitude of the deformation is dependent on the loading condition.

Please **add** a new heading at **page 3, above line 18**, as follows:

SUMMARY OF THE INVENTION

Please **replace** the paragraph at **page 3, lines 18 to 23,** with a replacement paragraph amended as follows:

The object of the invention is to present a ~~flow-mechanically~~ <u>fluid dynamically</u> effective surface of a device moving in a fluid, especially a flying machine, especially a lifting surface of a flying machine, which comprises a deformation that is most advantageous for a minimal ~~flow-mechanically resistance,~~ <u>fluid dynamic drag,</u> to the extent possible for every condition.

Please **delete** the paragraph at **page 3, lines 24 to 25.**

Please **delete** the paragraph at **page 4, lines 1 to 2.**

Please **replace** the paragraph at **page 4, lines 3 to 27,** with a replacement paragraph amended as follows:

~~Through~~ <u>The above object has been achieved through</u> the invention <u>whereby</u> there is provided a ~~flow-mechanically~~ <u>fluid dynamically</u> effective surface of a device moving in a fluid, especially a flying machine, especially a lifting surface of a flying machine. The surface comprises an elastic axis extending in the span direction of the surface, and an adjustable control surface. According to the invention it is provided that the surface is elastically deformable in the bending direction and/or in the direction about the elastic axis, dependent on the adjustment of the control surface, in connection with

change of the induced ~~flow-mechanical resistance,~~ fluid dynamic drag and that a control and/or regulating device for adjusting the control surface in the sense of a minimization of the induced ~~flow-mechanical resistance~~ fluid dynamic drag of the surface is provided. A significant advantage of the inventive ~~flow-mechanical~~ fluid dynamic surface is that a distribution of the lift force over the wing span, which distribution is optimal for the drag or resistance, can be produced for practically every flight and loading condition. For the lifting surface of an aircraft this means that an adaptation of the deformation can be achieved for practically every flight condition through the invention. Moreover, the invention can be used to advantage for additional functions, such as the support or assistance of the roll control, a load reduction, an improvement of the flutter stability, and a use for the stabilization and/or control of the lateral movement about the aircraft vertical axis, in case the plane of the control surface comprises a vertical component.

Please **replace** the paragraph at **page 5, lines 19 to 21,** with a replacement paragraph amended as follows:

According to a different ~~preferred~~ embodiment of the invention, the control surface can be arranged outside of the wing span. This achieves an effective enlargement of the wing span.

Please **replace** the paragraph at **page 6, line 21 to page 7 line 7,** with a replacement paragraph amended as follows:

In this regard, the surface is especially a lifting wing of a flying machine, whereby the wing tip surface (winglet) continues the lifting wing, sloping obliquely or extending vertically upwardly, and the control surface continues the lifting wing in its direction or continues the lifting wing sloping obliquely downwardly. In combination with the winglet, the control surface results in a second wing tip, whereby two edge or tip vortices are formed, which similarly contributes to the reduction of the induced resistance or drag.

Please **replace** the paragraph at **page 7, line 17 to page 8 line 2,** with a replacement paragraph amended as follows:

According to a different advantageous embodiment of the invention, a regulating arrangement is provided, which produces an adjusting or actuating signal for the control surface by comparison of measured data, for example data measured in an optical manner, representing the actual elastic deformation of the ~~flow-mechanically~~ fluid dynamically effective surface, with desired or nominal data representing a nominal or desired deformation of the ~~flow-mechanically~~ fluid dynamically effective surface prescribed for the aircraft loading and the flight condition.

Please **add** a new heading at **page 8, above line 3**, as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

Please **replace** the paragraph at **page 9, lines 4 to 8**, with a replacement paragraph amended as follows:

Fig. 7 a diagram, which represents the relationship between lift distribution and induced resistance <u>or drag</u> for the case of conventional lifting surfaces and for the case of a lifting surface according to example embodiments of the invention;

Please **add** a new heading at **page 9, above line 17**, as follows:

DETAILED DESCRIPTION OF PREFERRED EXAMPLE EMBODIMENTS OF THE INVENTION

Please **replace** the paragraph at **page 9, line 17 to page 10 line 3**, with a replacement paragraph amended as follows:

Six different example embodiments of ~~flow-mechanically~~ <u>fluid dynamically</u> effective surfaces, namely of lifting surfaces of an aircraft, are illustrated in the Figs. 1 to 6. The surface 1 is respectively illustrated in a schematic perspective manner, and the direction of incident flow or relative wind during flight is indicated by a correspondingly designated arrow. The surface 1 has a span direction 6, which increases **[[~~with~~]]** <u>in the direction of</u> the illustrated arrow beginning from the fuselage of the aircraft, which is not expressly illustrated. An elastic

axis EA, about which the surface 1 is deformable in the torsional direction and in the bending direction, extends in the span direction 6 of the surface 1.

Please **replace** the paragraph at **page 10, lines 7 to 17,** with a replacement paragraph amended as follows:

For all of the example embodiments illustrated in the Figs. 1 to 6, it applies that the surface 1 is elastically deformable in the bending direction and/or in the direction about the elastic axis EA, that is to say in the torsion direction, due to the aerodynamic forces effective during flight, dependent on the adjustment or setting of the control surface 3 while varying or changing the induced ~~flow-mechanical resistance.~~ fluid dynamic drag. This elastic deformation is adjusted or set by a control and/or regulating arrangement such that the induced ~~flow-mechanical resistance~~ fluid dynamic drag of the surface 1 is minimized. The control and/or regulating arrangement will later still be explained in more detail.

Please **replace** the paragraph at **page 13, line 21 to page 14 line 10,** with a replacement paragraph amended as follows:

The diagram illustrated in Fig. 7 shows the relationship between the lift distribution and the induced resistance or drag over the span direction y. An elliptical distribution of the lift, which corresponds to a minimal induced aerodynamic ~~resistance,~~ drag, arises for ~~an even,~~

a planar [[~~or~~]] level wing with an elliptical plan form. With a non-elliptical plan form of the wing or rather the surface 1, a corresponding lift distribution can be achieved by different twisting or torsion of the wing profile chord relative to the direction of incident flow in the span direction. The same effect arises through different wing deformation conditions. Through the control surface 3, the elastic deformation can be adapted or matched to the ~~minimal-resistance~~ minimal drag form. An elliptical distribution with minimal ~~resistance~~ drag (k = 1.0) is illustrated, and ~~as well~~ non-elliptical distributions (k > 1.0) are also illustrated in a dotted and dash-dotted manner.

Please **replace** the paragraph at **page 14, lines 11 to 24,** with a replacement paragraph amended as follows:

In a schematic illustration, Fig. [[~~12~~]] 8 shows an example embodiment for the control of the deformation of the surface 1 by a readjustment of the control surface 3. Aircraft loading data and flight condition data 10 are produced from measurements and calculations. From these aircraft loading and flight condition data 10, stored data in the form of tables with desired or nominal values 11, which are determined from calculations or from measurements, are derived, [[~~(11),~~]] a command 12 for the control of the control surface 3 in the form of an actuating or adjusting signal is derived [[~~(12)~~]] from

these derived nominal value data 11, and with the help of this actuating signal 12 the control surface 3 is adjusted in the sense of a minimization of the induced ~~flow-mechanical resistance~~ fluid dynamic drag of the surface 1, as explained initially above.

Please **replace** the paragraph at **page 14, line 25 to page 15 line 17,** with a replacement paragraph amended as follows:

Fig. 9 shows a schematic diagram for the regulation of the deformation of the surface 1 by the control surface 3. The actual deformation of the surface 1 is measured [[~~(13),~~]] in measurement unit or step 13 for example in an optical manner, and the measured data acquired thereby, which represent the actual deformation of the surface 1, are compared [[~~(14)~~]] in comparison unit or step 14 with desired or nominal data of a desired or nominal deformation that is optimal in the sense of a minimization of the induced ~~resistance~~ drag for the existing flight condition and the aircraft loading, from this comparison 14 a command for the readjusting of the control surface 3 is produced [[~~(15)~~]] in command generation unit or step 15 in the form of an actuating signal and is transferred to the control surface 3. Hereby there is achieved an adaptation or matching of the deformation of the surface 1 in the sense of a minimization of the induced ~~flow-mechanical resistance~~ fluid dynamic drag of the surface 1, as explained initially above. This is achieved when the measured data

representing the actual elastic deformation of the surface 1 correspond with the nominal data representing the desired or nominal deformation prescribed for the aircraft loading and the flight condition.

Please **replace** the paragraph at **page 15, lines 18 to 25,** with a replacement paragraph amended as follows:

The principle for a ~~flow-mechanically~~ <u>fluid dynamically</u> effective surface of a device moving in a fluid and its elastic deformation for minimizing the induced ~~flow-mechanical resistance~~ <u>fluid dynamic drag</u>, described above in connection with a lifting surface of an aircraft, is similarly transferable or applicable to other types of flying machines, such as to rotary wing aircraft, but also basically applies for other types of ~~flow-mechanically~~ <u>fluid dynamically</u> effective surfaces of a device moving in a fluid.

[RESPONSE CONTINUES ON NEXT PAGE]